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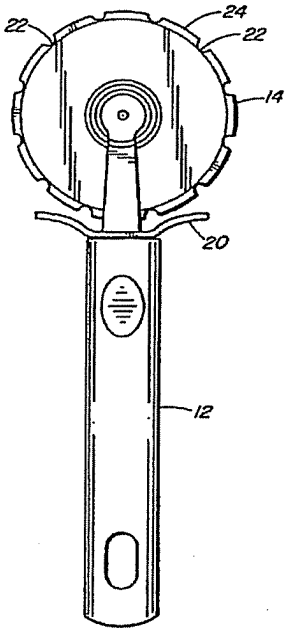
(54) **OUTIL DE PREPARATION DE GREFFE CUTANEE**
(54) **SKIN GRAFT PREPARATION TOOL**



(57) A tool for preparing a skin graft which can be expanded to form a mesh, includes a handle to be grasped by the hand of the operator and a circular blade freely rotatably mounted to the handle. The blade has a sharp cutting edge around its periphery, the blade periphery being notched at circumferentially spaced intervals to provide cutting sections between the notches of a selected length in the circumferential direction. A skin section placed on a hard backing surface may thus be provided with a selected array of spaced cuts by the operator by rolling the blade on the skin surface along successive parallel paths while pressing the blade cutting edge into the skin section and toward the backing surface.

ABSTRACT OF THE DISCLOSURE

A tool for preparing a skin graft which can be expanded to form a mesh, includes a handle to be grasped by the hand of the operator and a circular blade freely rotatably mounted to the handle. The blade has a sharp cutting edge around its periphery, the blade periphery being notched at circumferentially spaced intervals to provide cutting sections between the notches of a selected length in the circumferential direction. A skin section placed on a hard backing surface may thus be provided with a selected array of spaced cuts by the operator by rolling the blade on the skin surface along successive parallel paths while pressing the blade cutting edge into the skin section and toward the backing surface.

SKIN GRAFT PREPARATION

BACKGROUND OF THE INVENTION

The present invention relates to the preparation of skin grafts, particularly skin grafts prepared in such a way that a relatively small area of skin may be expanded to form a mesh which is then grafted over a larger area on the patient.

Mechanical skin expanders have become the state of the art instrumentation for the efficient expansion and application of large skin grafts. This has reduced donor site areas. Graft meshing has also increased skin graft take particularly in areas difficult to dress where fluid accumulation can occur, or where there is a high incidence of sepsis. The skin expansion instruments currently available are expensive and require expensive upkeep to maintain their effective operation. Because of this they have not yet found wide spread application or acceptance in Third World work. Indeed when harvesting small areas of skin the set up time for these instruments and the mechanical problems that can occur often result in the surgeon choosing to work with a more traditional meshing technique wherein the skin graft is mechanically perforated by a scalpel blade, or an osteotome used on a wood backing. Some degree of expansion can be achieved by these traditional techniques, although it will be less than optimal compared to that obtainable mechanical expander.

SUMMARY OF THE INVENTION

It is a basic object of the present invention to provide an improved tool and method for preparing skin grafts which can be expanded to form a mesh and which is particularly useful in Third World conditions and which invention achieves many of the benefits of currently available mechanical skin expanders but without the substantial cost and maintenance problems associated therewith.

Accordingly, the invention in one aspect provides a tool for preparing a skin graft which can be expanded to form a mesh, said tool comprising: a handle to be grasped by the hand of the operator; a circular blade freely rotatably mounted to said handle; said blade having a sharp cutting edge around its periphery; the blade periphery being notched at circumferentially spaced intervals to provide cutting sections between the notches of a selected length in the circumferential direction; whereby a skin section placed on a hard backing surface may be provided with a selected array of spaced cuts by the operator by rolling the blade on the skin surface along successive parallel paths while pressing the blade cutting edge into the skin section and toward the backing surface.

In a further aspect of the invention said notches are at least about 3mm deep in the radial direction.

In a still further aspect of the invention said notches are spaced to provide cutting sections therebetween having a length from about 5mm to about 10mm in the circumferential direction.

Preferably and in a further aspect of the invention said notches are semi-circular in outline shape.

In the preferred form of the invention a single said circular blade is mounted to said handle by a bracket having a spaced pair of forks having an axle fixed to a distal end thereof and on which said blade is mounted for rotation between said forks.

An improved method of preparing the graft is also described and claimed herein.

These and other objects, aspects and features of the present invention will be better understood from the following detailed description of a preferred embodiment of same when read in conjunction with the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1A is a somewhat diagrammatic representation of a skin section

provided with a plurality of spaced apart parallel rows of staggered cuts;

Fig. 1B is a diagrammatic representation of the skin sample after it has been stretched to form a mesh;

Fig. 2 is an elevation view of a skin graft tool in accordance with the present invention showing the blade edge-on;

Fig. 3 is a further elevational view of the tool taken at right angles to the circular blade.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring firstly to Figs. 2 and 3 there is shown a typical tool 10 for preparing a skin graft which can be expanded to form a mesh. The tool includes an elongated handle 12 of a convenient size and shape for grasping by the hand of the surgeon. A relatively thin circular blade 14 is freely rotatably mounted adjacent one end of the handle by a bracket 16 defining a spaced pair of forks. Bracket 16 includes an axle 18 which extends through the distal ends of the bracket forks and through a suitably sized aperture at the centre of blade 14 thereby mounting blade 14 for free rotation between the bracket forks. A guard 20 is disposed at the interface between bracket 16 and the end of handle 12 with the guard 20 extending laterally outwardly as best seen in Fig. 3 by a sufficient distance in both directions as to assist in preventing the hand of the user from coming into contact with the sharp cutting edge of the blade 16.

Blade 16 has a sharp cutting edge around its periphery with the blade periphery being provided with notches 22 at circumferentially spaced intervals thereby to provide cutting sections 24 between the notches, which cutting sections are of a selected length in the circumferential direction.

The tool as described above preferably comprises a modified simple pizza cutter, preferably a strong high quality model such as made by Henckel of Germany. As described above it has only one moving part (blade 16) and its cutting edge can be maintained razor sharp by a simple means such as a fine grit abrasive film. This tool is well suited for third world conditions as it can be

readily modified in any simple shop using a chain saw file (which is of circular cross section) or a pattern file or a diamond bit as will be described in more detail hereinafter.

In the course of modifying the pizza cutter referred to above it is best to sharpen the cutting edge of the blade 14 first and this is done most easily by using a one inch wide sanding belt sharpening system. This is relatively quick and efficient and avoids loss of blade temper as a result of the heating that could occur if a grindstone is used. The final cutting edge is achieved using 0.5 micron CRO 2 film or equivalent.

The circular cutting blade of a typical Henckel pizza cutter as referred to above has an overall diameter of about 60mm and is approximately 1mm thick. The notches 22 are typically provided by holding the blade 14 secure in a vice and using either a hand drill with a diamond burr or alternatively a chain saw file or a round pattern file to achieve a series of evenly spaced notches (preferably of semi-circular outline) the notches being at least about 3mm deep in the radial direction. These notches 22 in a typical case would also be approximately 3mm wide at the perimeter of the cutting blade and in the embodiment shown, with the notches being cut at approximately 13mm centre-to-centre distances, this provides cutting sections 24 between the notches which are about 10mm long in the circumferential direction. This arrangement is capable of producing a well meshed graft that expands about 2 to 3 times its original size. The degree of expansion depends upon how far apart the parallel cuts are made in the skin graft. For a more finely meshed graft with about 1.5 times expansion the notches are more closely spaced to provide 5mm-6mm long cutting sections or intervals between the notches on the circular blade 14. The blade 14 can be used to cut skin on any wooden or plastic surface running parallel to the grain to ensure uniform and total skin perforation. Woods of moderate density seem best suited. The blade will dull less quickly than with an exceptionally hard wood. Very soft wood will wear and become ridged

quickly.

Skin strips which are some 4 or 5mm wide will allow for the suturing of the graft down with ease. Narrower skin strips can also be cut to allow increased expansion with 2 to 3mms being optimal. In order to allow custom meshed grafts to be made for all likely areas, the surgeon should have on hand at least two such tools 10, the first one having notches 22 on the circular blade which are sized and spaced to provide cutting sections or intervals in the order of 5mm-6mm long while the other tool is provided with notches 22 sized and spaced to provide cutting sections or intervals in the 10mm length range. These dimensions are not absolutely critical and some practitioners may find that slight deviations from the suggested dimensions given above still yield good results. For additional information in this area reference may be had to the publication of Vandeput, J.J., Tanner, J.D., and Beswick J. titled "Implementation of Parameters in the Expansion Ratio of Mesh Skin Grafts", Plastic and Reconstructive Surgery, Sept. 1997.

The preparation of the skin graft involves placing a skin section of the desired size on a backing surface as described above. The tool 10 described above is then utilized by rolling the blade on the skin surface along a fairly straight line path of travel while pressing the blade cutting edge into the skin section against the backing surface to produce a series of linearly arranged spaced cuts in the skin section. This last mentioned step is then repeated along successive paths of travel parallel to the first mentioned path while at the same time indexing or rotating the cutting blade slightly before starting along each path such that the cuts along each such path are staggered relative to the cuts in the path(s) next adjacent thereto. This provides the staggered array of cuts as depicted in Fig. 1A giving optimal expansion.

Following the above procedure, the skin graft preparation is completed by applying stretching forces to the skin section generally at right angles to the direction of the cut lines thereby to cause the cuts to open and the skin section

to expand and form a mesh skin graft, this procedure being well known per se in the art.

For best results, the blade 10 should be kept as sharp as reasonably possible at all times. Minor resharpening of the blade is usually required following preparation of some 10 to 15 grafts depending of course on graft size and possibly other circumstances.

As noted previously, the extreme simplicity of the tool described above, its very low initial cost and ease of maintenance, makes the tool ideally suited for work in the Third World although the invention is not limited to use in such applications. Various modifications and adjustments to the tool and the techniques used may be made without departing from the spirit and scope of the invention.

CLAIMS

1. A tool for preparing a skin graft which can be expanded to form a mesh,--said tool comprising:

a handle to be grasped by the hand of the operator;

a circular blade freely rotatably mounted to said handle;

said blade having a sharp cutting edge around its periphery;

the blade periphery being notched at circumferentially spaced intervals to provide cutting sections between the notches of a selected length in the circumferential direction;

whereby a skin section placed on a hard backing surface may be provided with a selected array of spaced cuts by the operator by rolling the blade on the skin surface along successive parallel paths while pressing the blade cutting edge into the skin section and toward the backing surface.

2. The tool according to claim 1 wherein said notches are at least about 3mm deep in the radial direction.

3. The tool according to claim 1 or 2 wherein said notches are spaced to provide cutting sections therebetween having a length from about 5mm to about 10mm in the circumferential direction.

4. The tool according to any one of claims 1-3 wherein said notches are semi-circular in outline shape.

5. The tool according to any one of claims 1-4 wherein a single said circular blade is mounted to said handle by a bracket having a spaced pair of

forks having an axle fixed to a distal end thereof and on which said blade is mounted for rotation between said forks.

6. A method for preparing a skin graft which can be expanded to form a mesh comprising the steps of:

(a) providing a tool as recited in any one of claims 1-5;

(b) placing a skin section on a backing surface;

(c) rolling the blade on the skin surface along a path of travel while pressing the blade cutting edge into the skin section toward the backing surface to produce a series of linearly arranged spaced cuts in said skin section;

(d) repeating step (c) along successive paths of travel parallel to the first mentioned path while indexing said blade before starting along each path such that the cuts along each of said paths are staggered relative to the cuts in the path (s) next adjacent thereto.

7. A method of preparing a skin graft comprising effecting the steps recited in claim 6 and then applying stretching forces to the skin section generally normal to the direction of said paths to cause the cuts to open and the skin section to expand and form a meshed skin graft.

FIG. IA

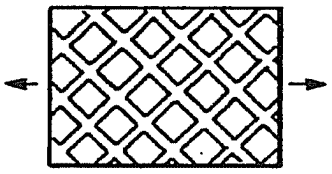


FIG. IB

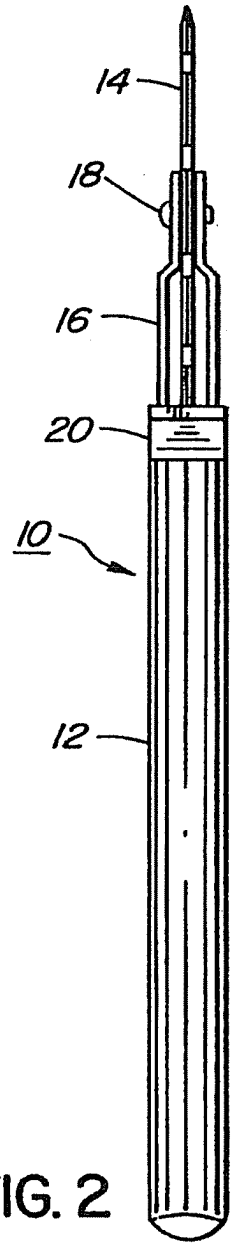


FIG. 2

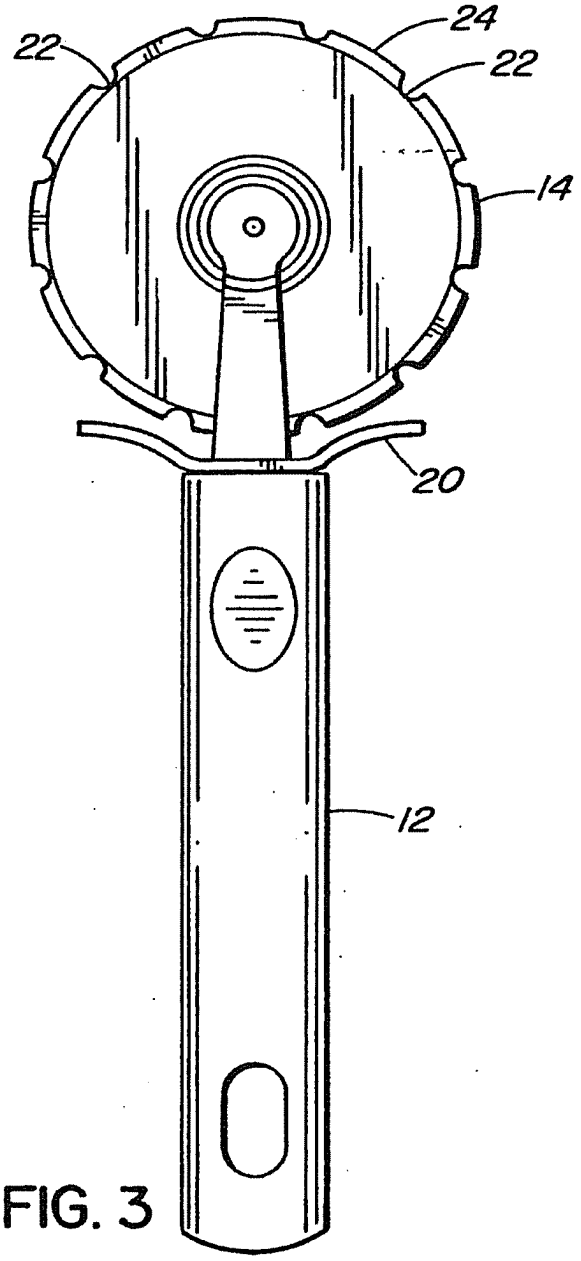


FIG. 3